

Claims

1. A vehicle drive system comprising:

an electric motor;

a hybrid fuel cell comprising a fuel cell portion and a rechargeable battery portion; and

5 a hydrogen storage unit for storing and supplying hydrogen to said hybrid fuel cell;

said fuel cell portion and said rechargeable battery portion being adapted to operate alone or in tandem to power said electric motor;

10 said fuel cell portion and said rechargeable battery portion being adapted to share at least one reactant.

2. The vehicle drive system according to claim 1, wherein said hybrid fuel cell further comprises an anode section including one or more anodes shared between said fuel cell portion and said rechargeable battery portion.

4. The vehicle drive system according to claim 2, wherein said anode comprises an anode active material, said anode active material including zinc, cadmium, magnesium, or aluminum.

5. The vehicle drive system according to claim 4, wherein said anode comprises 90 to 99 weight percent of said anode active

material and 1 to 10 weight percent of a binder material.

6. The vehicle drive system according to claim 2, wherein said anode comprises a hydrogen storage material and/or Raney nickel.

7. The vehicle drive system according to claim 6, wherein said anode comprises 0.0 to 88.0 weight percent of said hydrogen storage material, 0.0 to 88.0 weight percent Raney nickel, 4.0 to 12.0 weight percent of a binder material, and 0.0 to 5.0 weight percent of a conductive material.

8. The vehicle drive system according to claim 7, wherein said conductive material comprises graphite or graphitized carbon.

9. The vehicle drive system according to claim 7, wherein said hydrogen storage material comprises Rare-earth metal alloys, Misch metal alloys, zirconium alloys, titanium alloys, magnesium/nickel alloys, or mixtures thereof.

10. The vehicle drive system according to claim 2, wherein said fuel cell portion comprises at least one cathode, said cathode being in electrical communication with said anode.

11. The vehicle drive system according to claim 10, wherein said cathode comprises a carbon matrix with an active catalyst material catalytic toward the dissociation of molecular oxygen dispersed therein.

12.. The vehicle drive system according to claim 11, wherein said active catalyst material is selected from silver, silver alloys, silver oxide, cobalt, cobalt oxide, cobalt manganese oxide, nickel, manganese oxide, manganese dioxide, pyrolyzed macrocyclics, or combinations thereof.

13. The vehicle drive system according to claim 11, wherein said cathode further comprises a peroxide decomposing material.

14. The vehicle drive system according to claim 2, wherein said rechargeable battery portion comprises at least one auxiliary electrode, said auxiliary electrode being in electrical communication with said anode.

15. The vehicle drive system according to claim 14, wherein said auxiliary electrode comprises a positive electrode material.

16. The vehicle drive system according to claim 15, wherein said auxiliary electrode is a nickel electrode.

17. The vehicle drive system according to claim 15, wherein said auxiliary electrode is a silver electrode.

18. The vehicle drive system according to claim 15, wherein said positive electrode material comprises 75 to 85 weight percent of a positive electrode active material, 0.0 to 10 weight percent cobalt, 0.0 to 10 weight percent cobalt oxide, and 0.0 to 4.0 weight percent of a binder material.

19. The vehicle drive system cell according to claim 18, wherein said positive electrode active material is selected from nickel hydroxide/nickel oxyhydroxide, copper oxide, silver oxide, manganese dioxide, or combinations thereof.

20. The vehicle drive system according to claim 1, wherein said rechargeable battery portion is adapted to accept an electrical current from a source of power external to said hybrid fuel cell.

21. The vehicle drive system according to claim 1, wherein said rechargeable battery portion is adapted to accept an electrical current produced by said fuel cell portion.

22. The vehicle drive system according to claim 1, wherein

said fuel cell portion and said rechargeable battery portion share an electrolyte.

23. The vehicle drive system according to claim 1, wherein said hydrogen storage unit comprises a pressure containment vessel at least partially filled with a hydrogen storage alloy.

24. The vehicle drive system according to claim 1, wherein said hydrogen storage unit comprises a pressure containment vessel adapted to store hydrogen in liquid or gaseous form.